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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,325	12/14/2001	Tomohiko Shibata	782_206	8198

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EXAMINER	
IM, JUNGHWA M	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 08/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/017,325	SHIBATA ET AL.	
	Examiner	Art Unit	
	Junghwa M. Im	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8 and 10-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8 and 10-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6 and 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisato et al. (US 5990496), hereinafter Kunisato in view of Tsujimura et al. (US 6265287), hereinafter Tsujimura and Morita (US 6232623).

Regarding claims 1 and 11-13, Fig. 1 of Kunisato shows a light-emitting semiconductor device comprising:

a sapphire substrate (1);

an underlayer (a first semiconductor nitride layer) on the substrate including at least Al (2; an AlN(Ga) layer), the crystallinity of the AlN(Ga) being set to have full width at half maximum X-ray rocking curve value of 90 seconds or below (col. 7, lines 63-67 and Table 2);

a buffer layer (3; a second semiconductor nitride layer) on the an underlayer (a first semiconductor nitride layer); and

a semiconductor layer group (4, 5, 6, 7, 8) on the AlN(Ga) layer comprising a third semiconductor nitride including at least Ga (col. lines 29-49), and being independent from the AlN(Ga) layer and buffer layer, wherein the Al content of the semiconductor nitride (Al composition ratio is 0.2 in the layer 7.) set smaller than that of the first semiconductor nitride (Al composition ratio is 0.5 in the layer 2; col. 5, lines 29-39.).

Fig. 1 of Kunisato shows the most aspect of the pending claim except "the thickness of the underlayer is set with a thickness of 0.5-1000 um, and the thickness of the buffer layer is set within 0.002-0.1 um." Fig. 1 of Tsujimura shows that the thickness of the underlayer (12; the first semiconductor nitride layer on the substrate) is 500nm (col. 4, lines 41-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention made to incorporate the teachings of Tsujimura into the device of Kunisato in order to have to the thickness of the underlayer (a first semiconductor nitride layer on the substrate) set with a thickness of 0.5-1000 um to accommodate the thickness of the base layer.

The combined teachings of Kunisato and Tsujimura fail to show "the thickness of the buffer layer is set within 0.002-0.1 um." Fig. 7 of Morita shows that the thickness of the GaN buffer layer (the second semiconductor nitride layer) formed on the AlGaN layer (the first semiconductor nitride layer) is 30 nm.

It would have been obvious to one of ordinary skill in the art at the time of the invention made to incorporate the teachings of Morita into the device of Kunisato and Tsujimura in order to have the thickness of buffer layer set within 0.002-0.1 um to improve the yield efficiency of subsequent crystallization

Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have the thickness of the underlayer and buffer layer (the second semiconductor nitride layer) set in the range recited in the instant invention to meet the required specification since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller,* 105 USPQ 233.

Regarding claim 2, Kunisato discloses that that Ga content of the second semiconductor nitride is set not more than that of the third semiconductor nitride (col. 5, lines 29-39). In detail, Kunisato discloses that the second semiconductor nitride (3; GaN) is set equal to that of the third semiconductor nitride (6; GaN).

Regarding claims 3 and 4, Kunisato discloses that Al content of the first semiconductor nitride is set at least 50 atomic percentages of all of the III elements present in the first semiconductor nitride (See Table 2).

Regarding claims 5 and 6, Kunisato discloses that the underlayer (the first semiconductor nitride layer) is formed by a MOCVD method (col. , lines 54-68).

Note that "formed at a temperature of " and "by a MOCVD method" are a process designation, and would thus not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 10, Morita discloses gradual reduction of Al content from the substrate toward the buffer layer (col. 9, lines 22-26).

Regarding claim 14, Kunisato discloses the thickness of the buffer layer (0.2 um) is smaller that the thickness of the underlayer (1.1 um) and the thickness of the semiconductor group (2 um for the layer 5 alone).

Regarding claim 15, Kunisato discloses the thickness of the underlayer (1.1 um) is greater layer than 0.5 um and equal to or less than 1000 um.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kunisato, Tsujimura and Morita as applied to claim 1 above, and further in view of Chiyo et al. (US 6593016), hereinafter Chiyo.

Regarding claim 8, the combined teachings of Kunisato, Tsujimura and Morita disclose that the substrate is made of sapphire single crystal (col. 5, line 29), however, fail to teach that "the underlayer is formed on the main surface of the substrate via a surface nitride layer formed at the main surface." Fig. 8 of Chiyo shows that the underlayer (the semiconductor nitride layer including aluminum; AlN) on the main surface of the substrate via a surface nitride layer (13) formed at the main surface (col. 10, lines 8-11).

It would have been obvious to one of ordinary skill in the art at the time of the invention made to incorporate the teachings of Chiyo into the device of Kunisato, Tsujimura and Morita in order to have the underlayer formed on the main surface of the substrate via a surface nitride layer formed at the main surface to improve crystallinity.

Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655.

The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Loke can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jmi

Primary Examiner
Steven Loke